



## Original Articles

## The effectiveness of contrast bath to reduce joint pain in the elderly

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### ABSTRACT

**Background:** The aging process results in changes in the musculoskeletal system causing a decrease in function of joints, loss of elasticity and limited mobility. This condition also causes joint pain, especially in the joints supporting the body weight, namely the knee. The previous studies discussed the method of reducing pain using a contrast bath which was implemented by soaking parts of the body that experience pain alternately with hot and cold water, this was difficult to apply if the pain occurs in the upper body. Modifications in contrast baths using compresses to the knee joint have never been implemented before.

**Objective:** This study aimed to figure out the effect of the contrast bath method using compresses to reduce knee joint pain in the elderly.

**Method:** The design of this study was pre-experimental with one group of pre-test-posttest. The sample used was 16 elderly who were selected by random sampling at *Posyandu* (a center for pre- and postnatal health care and information for elderly) in village of Sawit Gantiwarno, Klaten. Contrast bath is applied by giving compresses of warm and cold water alternately with a ratio of three minutes: one minute per-day during 20 minutes, for a week. Pain measurement is performed using the Visual Analog Scale (VAS) instrument.

**Result:** The mean of knee pain before giving a contrast bath was 5.44, whereas after a contrast bath was 3.50. Bivariate analysis used Wilcoxon, it showed p value <0.05 which means there was a significant difference in knee joint pain before and after contrast baths were applied.

**Conclusion:** Administration of contrast bath can reduce knee joint pain in the elderly.

### INTRODUCTION

The aging process results in morphological, functional and pathological changes. Changes in the musculoskeletal system due to aging is in the form of hyaline cartilage erosion, degeneration of the ligament and *peri* articular. This condition causes a decrease in joint function, loss of elasticity and limited mobility which causes joint pain, especially in the joints supporting weight, namely the knee in the elderly. Cartilage disorders result in bones rubbing against each other, causing pain in the joints, especially when the joints move or bear a load.<sup>1</sup> This joint problem can cause several diseases such as osteoarthritis, rheumatoid arthritis, gout and pseudo-gout, senile mono-articular arthritis and polymyalgia rheumatism.<sup>2</sup> A research reveals that knee pain in osteoarthritis affects the physical activity of elderly with disability/immobility that can cause various complications.<sup>3</sup>

The prevalence of joint disease in Indonesia at the age of 55-64 years was 15.5%. It was 18.6% at the age of 65-74 years, while at the age of > 74 years it was 18.9%.<sup>4</sup> Other studies revealed the prevalence of pain which was more common in older adults (60%-86%).<sup>5</sup> A data survey conducted at the Health Office of Klaten Regency described that the cases of joint pain in the elderly reached 11.351 elderly throughout 2018. The elderly who experienced joint pain in the region also have a vulnerable age between 60-75 years.

Joint pain in the elderly causes disruption of their daily activities, decreases productivity and can also cause frustration.<sup>6</sup> Results of previous studies reveal that knee pain in osteoarthritis affects the physical activity of the elderly such as eating, drinking, walking, sleeping, bathing, dressing, defecating and urinate.<sup>3</sup> There are several actions that

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can be implemented to reduce pain. In some cases of mild pain, non-pharmacological measures are the most important interventions while pharmacological measures are prepared to anticipate the development of pain. According to the results of the study, 35.9% of the elderly use pain-killers at home to treat pain.<sup>7</sup> Pharmacological therapy that is often used to treat joint pain is generally from the group of Non-Steroid Anti-Inflammatory Drug (NSAID), this drug has the risk of causing problems due to interactions with the drug group of H-2 blocker (Ranitidine), which is 11.7%.<sup>8</sup>

Non-pharmacological therapeutic option which is easy and inexpensive to reduce joint pain in the elderly is with the contrast bath technique.<sup>9</sup> Previous studies discussed the method of reducing pain using a contrast bath was conducted by dipping parts of the body that experience pain alternately with hot and cold water, this is difficult to apply if the pain occurs in the upper body. Modifications in contrast baths using compresses to the knee joint have never been implemented before.<sup>10</sup> This study aims to determine the effectiveness of contrast baths to reduce knee joint pain in the elderly.

## METHOD

### Study Design

This study is a pre-experimental research with one-group of pre-test post-test design.<sup>11</sup>

### Setting and Respondent

This study was conducted in January to July 2019 at *Po-syandu Lansia Teratai 4* (Integrated Services Center for the Elderly), Sawit village, Gantiwarno Sub-District of Klaten Regency. The population was elderly people. In the experimental study, number of samples used was 10 to 20 people.<sup>12</sup> This study used samples of 16 people. The sample selection was conducted according to inclusion criteria, namely: 1) Elderly aged 60-74 years, 2) Elderly experiencing knee joint pain on a scale of 4-6. The exclusion criteria in this study are: 1) Elderly taking analgesic drugs, 2) Elderly who experience immobility. Based on the inclusion and exclusion criteria, the sample of 42 people was obtained. Then 14 elderly who fulfilled the sample criteria were chosen randomly.

### Experimental Procedures

The provision of contrast bath therapy referred to the results of previous studies, namely by stimulating heat and cold alternately to obtain vasodilation and vasoconstriction responses from blood vessels.<sup>13</sup> The contrast bath was implemented by giving warm and cold compresses using a towel that has been soaked in hot water (41-43° C) and cold water (10-18° C) alternately in the knee area for 20 minutes with a compress time ratio of 3: 1 minute. Contrast bath is done every afternoon for seven days.

### The Instruments and Measurement

Pain measurement in this study was carried out using a Visual Analogue Scale (VAS) tool. The measurement was applied before and after the contrast bath.

### Data Analysis

The researchers used Wilcoxon test for its data analysis because the data were not normally distributed.

### Ethical Consideration

This study has passed an ethics test by the ethics committee of the Research and Community Service Institute (LPPM) of the Stikes Muhammadiyah Klaten.

## RESULTS

Based on table 1, the mean of respondents aged  $66.19 \pm 3.728$  years, included in the elderly category. Most respondents were female (62.5%) with 100% education of primary school graduate and the mostly worked as laborers (75%). The average pain in the knee joint of the elderly before being given a contrast bath was 5.44 and after the contrast bath it was 3.55.

Table 2 shows that there are eight respondents who experienced pain relief after contrast baths, while there were eight respondents who did not experience pain scale changes. Based on the results of the analysis using Wilcoxon, it shows a significant value of 0.005 ( $p < 0.05$ ) which means that there are significant differences in knee joint pain before and after intervention.

**Table 1.** Respondent characteristics (n=16)

Characteristics	Result
<b>Age</b> , year (mean $\pm$ SD)	66.19 $\pm$ 3.728
<b>Gender</b>	
Male	6 (37.5%)
Female	10 (62.5%)
<b>Education</b>	
Primary School Graduate	16 (100%)
<b>Occupation</b>	
Jobless	2 (12.5%)
Labor	12 (75%)
Private workers	0 (0%)
Entrepreneur	2 (12.5%)
Pensioner (Retired)	0 (0%)
<b>Pain scale</b> (mean $\pm$ SD)	
Before	5.44 $\pm$ 0.629
After	3.55 $\pm$ 0.730

## DISCUSSION

Table 1 shows the average joint pain in the elderly before contrast bath which is 5.44. Joint pain that occurs in the elderly is caused due to changes because of the aging process. The joints of the elderly will experience fibrillation, uneven surface of the joints, and the presence of-

**Table 2.** Reduce of joint pain, before and after contrast bath (n=16)

Variable		n	Mean Rank	Z	p-value
Pain before contrast bath - Pain after contrast bath	Negative Ranks	8 <sup>a</sup>	4.50	2.828	0.005
	Positive Ranks	0 <sup>b</sup>	0.00		
	Ties	8 <sup>c</sup>			

- a. Pain in posttest < Pain in pretest
- b. Pain in posttest > Pain in pretest
- c. Pain in posttest = Pain in pretest

cracks/indentations on the surface of the joints due to hyaline cartilage erosion which results in joint pain, especially the knee as a weight support.<sup>2</sup> This is consistent with the results of this study, namely the average age of respondents who are almost 66 years old.

Based on table 1 of gender, it is found that the most of respondents are women; they are 10 (62.5%). Based on hormonal view, joint pain in the elderly tends to be experienced by women due to a significant decrease in the hormone estrogen associated with menopausal mass. Decreased hormone estrogen can have an impact on hyaline cartilage erosion. Knee joint pain is often experienced by the elderly due to excessive knee support as a weight support due to strenuous activity. A very strenuous activity done repeatedly or physically demanding work a person can increase the risk of knee joint pain.<sup>14</sup>

After the respondents got contrast bath they experienced a decrease in pain from 5.44 to 3.50. Table 2 also shows a significant difference in elderly knee joint pain before and after contrast bath therapy with a p value of 0.005. The results of this study were supported by previous studies that show the provision of contrast baths can reduce pain in myogenic.<sup>15,16</sup> In this study, contrast bath was performed on 16 elderly people who experience knee pain regularly for 7 days in the afternoon for 20 minutes by combining hot (41-43°C) and cold (10-18°C) with a duration of 3: 1 minute and repeated for five times. The total amount of warm compress time taken in this study was 15 minutes. The results of the study revealed that the longer duration of a warm bath which was 10 minutes could increase the fluctuation of good blood flow and improves blood circulation to the skin.<sup>17,18</sup>

Table 2 also shows that there were eight respondents who did not experience changes in the pain response before and after the contrast bath. The loss of neurons in the brain and spinal cord occurred as part of the normal aging process.<sup>19</sup> In the elderly > 65 years old, they would experience nerve conduction velocity decreases between 5-10% as a result of aging process. This condition could reduce response time and slow down impulse transmission, thereby it reduced perception of touch sensory and pain.

The administration of warm compresses on the knee joint will increase the caliber of blood vessels so that it will recover blood circulation in the compressed area. This is in

accordance with the results of the previous determination which showed the depth of heat penetration would further dilate blood vessels and affected the increase in blood flow.<sup>20-22</sup> Warm compresses can also stimulate the release of endorphins and enkephalin hormones that are useful for relieving pain, increasing comfort, and blocking the transmission of pain stimulus. Other research evidence also showed that giving a warm stimulus can reduce tissue damage.<sup>13</sup>

Duration of cold compresses administration was alternately for 1 minute and repeated 5 times so that its total time was 5 minutes. The results of previous studies indicated that administration of cold therapy can reduce edema through the vasoconstrictive response, as well as cause evacuation of the spleen and blood circulation.<sup>23-25</sup> Shrinking edema can reduce pressure on pain receptors,<sup>24</sup> and reduce cell necrosis so that it will reduce pain.<sup>16</sup> Vasoconstriction will cause a decrease in cellulite permeability, cellular diffusion and<sup>26</sup> neutrophil migration so that it can reduce inflammation that has an effect on pain inhibition.<sup>16</sup>

## CONCLUSIONS AND RECOMMENDATION

Contrast bath is effective to reduce knee joint pain in the elderly. Elderly people who experience joint pain can use contrast bath as an alternative method to reduce non-pharmacological pain.

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